NOISE SUPPRESION AND COCHLEAR IMPLANT SPEECH UNDERSTANDING IN AURALIZED REVERBERANT SOUND FIELDS

Lucas H.M. Mens1, Hannah Keppler2, Weigang Wei3, Ingeborg Dhooge2, Ad Snik1

1Radboud University Nijmegen Medical Centre, Nijmegen, the Netherlands

2Ear, Nose, and Throat Department, Faculty of Medicine and Health Sciences, Ghent University, Ghent, Belgium

3 Department of Information Technology, Faculty of Engineering and Architecture, Ghent University, Ghent, Belgium

In positive signal-to-noise ratios and damped test rooms, the Advanced Bionics' ClearVoice (CV) noise suppression has been reported to result in significantly improved speech understanding (Büchner et al, Otol Neurotol 2010). This study aims to test CV in reverberant conditions, as found in a classroom, with stationary and multitalker noise. Furthermore, it is tested which setting of the Input Dynamic Range (IDR) is optimal when using CV. Users of strong compression (large IDR) possibly will benefit more from noise-reduction (assuming a positive signal-to-noise ratio), but may also suffer more from the elimination of parts of the signal.

All reverberant conditions were generated using the Odeon software (B&K, type 7837), simulating an actual classroom (T30: 0.7 s). In a control experiment in normal hearing subjects, recordings were made in this room, varying the direct-to-reverberant ratio by varying the distance from source to a head and torso simulator (B&K, type 4128-C). A similar increase of the SRT for sentences in quiet with increasing distance was found for the auralized and recordings in the actual classroom.

Experienced users of the Advanced Bionics CII and 90 K implant were provided with CV at the medium setting. All materials were fed to the audio input of the Harmony processor. LIST sentences were presented in quiet and at +7 or +15 dB signal-to-noise ratio. Two levels of reverberation were simulated (T30: 0.3 and 0.8s) at two distances (0.5 and 3.0m). Between conditions, levels were adjusted for constant audibility. Preliminary results for speech in quiet show a decrement with increasing reverberation with and without CV. However, CV reduced the effect of reverberation with added stationary noise in some subjects, which was not apparent in multitalker noise. Results for different settings of IDR will also be reported.

Acknowledgments

Annelies Bockstael, Thomas Pieter and Dick Botteldooren of the Department of Information Technology (Acoustics), Faculty of Engineering and Architecture at Ghent University (Ghent, Belgium) provided the materials and technical support for the classroom recordings and produced the auralized speech material. Akke Bakker has run the control experiment with normal hearing subjects.